

Evolutionary Biology: The Scientific Basis for One Health & an Essential Part of Biomedical Education

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The **One Health Initiative**, a concept spearheaded by the **AVMA** and the **AMA**, was designed to acknowledge the commonality of and foster cooperation between medical professions. Since its initiation in 2007, the One Health Initiative has been endorsed by numerous medical, veterinary, and public health associations and their prominent professionals.¹ Its principles and objectives are sound, practical, and largely noncontroversial.

Notably lacking, however, has been a discussion of evolution as its principle underlying scientific basis. Acknowledging and embracing that concept is essential if the philosophy and objectives of One Health are to be realized. Training in evolutionary biology must be part of the education of every

veterinarian, physician, and biologist.

The **National Academy of Sciences** (NAS) has reviewed the validity and relevance of evolution,² and evidence supporting evolution, derived from and corroborated by multiple disciplines (eg, physics, astronomy, geology, paleontology, ecology, embryology, genetics), is overwhelming. The NAS report, the One Health Initiative, and the underpinnings of modern biology all reflect that which Theodosius Dobzhanski famously stated: “Nothing in biology makes sense except in light of evolution.”³ Veterinarians, by virtue of their focus on diverse organisms, are in a privileged position to recognize, implement, and benefit from this truth.

It is because of common ancestry that all living things have shared metabolic functions and respond in similar ways to pathogenic agents. The closer the evolutionary relationship between organisms, the greater is their similarity in anatomy, physiology, pathology, and response to treatment. The fact that diverse organisms respond to similar pharmacologic treatments is testament to common ancestry, which is the essence of One Health.

Principles of evolution readily apply to routine medical procedures (eg, antimicrobial sensitivity testing) or interpreting results of genetic tests. Microorganisms and parasites evolve to become drug resistant in accordance with laws of natural selection; molecular genetic techniques are applied to determine the basis of that resistance and develop new drugs to overcome it. New worldwide pandemics are likely to emerge. This frightening potential was recently illustrated in investigations of avian flu and the few genetic changes necessary to enable its airborne transmission between people.⁴ Only by understanding the evolutionary relationships among critical organisms (birds, pigs, viruses, and humans in the flu pandemic) will we be able to apply appropriate surveillance and develop specific vaccines and treatment.

Veterinarians are critical to such efforts and must be at the forefront of progress in preventing the next worldwide pandemic.

Evolutionary biology is a critical tool in our goal of lessening the burden of disease on this planet. On the other hand, blind faith in constructs (eg, intelligent design) leave us without the demonstrably efficacious tools of rationality and science. A case has been made for a course in evolutionary biology to be part of (human) medical education.⁵

It is imperative to expand this effort to all branches of biology and medicine, including veterinary medicine.

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References

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